

Tredegear Iron Works site, which became a Civil War museum. Saint Paul reused the former Harvest States Grain Elevators for conversion to commercial development near Upper Landing Park. In Tel Aviv, the former port areas were converted to a pleasure craft marina and many adjacent industrial sites were converted to parklands.

Wayfinding and Orientation

In Denver, as well as in several of the other parkway systems, dolmens, or standing stones, are used as entry markers and intermediaries between urban areas, plazas, and park areas. Most systems use map kiosks, and Hartford gives out walking tour maps at several prominent entry locations and uses park rangers for interpretation and security. River gateways and interpretive signage are used in almost every case. Phoenix makes special significance to river gateways at certain bridges. Portland’s river system uses highly distinctive “urban markers,” drawing from industrial vernacular responses, which corresponds to urban grid and tell stories about the history and ecology of the river. Richmond’s canal walk makes use of 29 large interpretive medallions, statues, historic structures and artifacts, and interpretive signage, woven throughout the parkway system. Saint Paul urban corridor tree plantings denote “stairs” that bring the city to the river.

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APPENDIX C  
THE ECOLOGICAL AND  
SOCIAL BENEFITS OF THE  
URBAN FOREST

By: Edward Anaya

Introduction

It is increasingly rare to come across a beautifully shaded avenue lined with mature, spreading trees that to many of us represents the ideal in urban and community tree plantings. Trees and urban forests are essential components of our communities and make communities more livable. Studies show that trees and shrubs improve a community’s appearance, improve energy efficiency, improve water and air quality, increase property values, and create wildlife corridors. Trees are also a factor in retaining and attracting residents, which promotes community stability.

The effect of trees in climatic modification is presented, highlighting the value of shade and windbreaking effects. Street trees also mitigate noise pollution by buffering the noise level of the city. Storm water runoff and erosion are also reduced by trees. The urban forest sustains wildlife habitat by providing suitable environments and travel corridors for birds and other wildlife. Property values are also influenced by street trees, as their presence can increase the value and desirability of an individual lot and residential street. Perhaps most significantly is the rela-

tionship of street trees and the urban forest to the quality of life. The value of trees in our everyday lives should not be underestimated.

**History of Urban Forestry**

In 1967, before the term “urban forestry” became widely known, a group of foresters, educators, and business people working with trees in urban areas organized an information and idea-sharing network they called the California Urban Forests Council. Since 1968, and even more so since becoming a California public benefit corporation and being recognized by the IRS as a 501(c)(3) nonprofit organization in 1984, CaUFC has pioneered and shepherded the development of urban forestry throughout California. Through its efforts to promote urban forestry, CaUFC has grown to an organization of over 300 members from the public, private, and nonprofit sectors, and continues to expand its outreach to the growing network of people interested in urban forestry. Today, there are urban forest councils modeled after CaUFC in most every state (CaUFC).

**What Is Urban Forestry?**

Urban forests are all the trees and other vegetation that grow in places where people live, work, and play, from small communities in rural areas to large metropolitan cities. This includes trees on public and private land, along streets, in residential areas, parks, and commercial developments, and in other locations within a community. They may be planted by design or grow by accident (Miller, 1988).

Most communities are unaware of the existence and importance of urban forests. Perhaps a contributing factor is that the term “urban forest” is an oxymoron. An urban forest includes all of the vegetation in and around a dense human settlement (Miller, 1997). Some of these forested areas may have been intentionally planned and landscaped, while other forested areas are left-over from small tracts of land preserved during development or left unattended. When buildings and other man-made structures are included with the urban forest, a complex ecosystem exists.

**Who Practices Community Forestry?**

Community forestry is the act of caring for our natural environment through the planting and management of trees in our parks, open spaces, common lands, yards, and streets. Supporters of community forestry include private citizens, professionals, and governmental agencies. Private and governmental professionals involved in community forestry come from the fields of forestry, arboriculture, horticulture, wildlife, biology, natural resource conservation, and urban or environmental planning. Citizens’ groups and grassroots organizations devoted to terrestrial

and/or watershed protection, community outreach and education and other civic-minded activities are also involved. Citizens active in their communities promote community forestry by devoting attention, energy, and time to actively care for their surroundings (EPA, 2003).

**How Does Community Forestry Begin?**

Community forest management programs can begin in different ways. The impetus may be a concerned resident or group that promotes a community beautification project, or the influence of the environmental quality of a neighboring community. Whatever the reason, everyone in the community has the opportunity to make a personal contribution. The success of the forest management program will be determined by the cooperation of everyone involved (EPA, 2003).

**Identifying Benefits and Costs of Urban and Community Forests**

**Benefits of the Urban Forest**

- Trees benefit communities in a number of important ways, including: Increase in property values
- Decrease in energy costs
- Improvement in air quality
- Reduction in storm water runoff
- Decrease in soil erosion
- Improvement in water quality
- Creation of wildlife habitat
- Increase in community pride
- Positive impact on consumer behavior
- Increase in recreational opportunities
- Improvement in health and well-being
- Reduction of noise levels
- Creation of buffer zones

**Increase in Property Values**

Urban forests contribute to the economic vitality and stability of a community by increasing property values. Most people think that neighborhoods with trees are attractive places to live. The values of houses in these neighborhoods are usually higher than those of comparable houses in neighborhoods without trees (Morales, 1980; Morales et al., 1983; Anderson and Cordell,

1988). Neighborhood green spaces or greenways typically increase the value of properties located nearby (Kitchen and Hendon, 1967; More et al., 1983; Correll et al., 1978). Developers may profit when they receive a higher price for a property with trees. In many instances, careful preservation of existing trees during construction may actually cost less than clearing the land (Seila and Anderson, 1982). The cost of preserving trees, such as the extra time needed for planning and using special techniques to protect the trees, should be looked at in relation to the immediate and long-term benefits of increased property values. Mature trees are especially valuable in areas where old housing or buildings have lost value. This is important to keeping downtown neighborhoods vital.

Decrease in Energy Costs

Trees can help reduce heating and cooling costs by shading buildings, acting as windbreaks, and cooling the air through the evaporative process of transpiration. When planting a tree to reduce energy costs, the species of tree, site location, type of building, and year-round climate should be considered. Reducing the need for electricity or gas energy also conserves fossil fuels and reduces carbon emissions. However, planting the wrong tree in the wrong place may increase energy costs.

Shade

Trees properly placed around buildings and air conditioning units can help reduce cooling costs (McPherson, 1994b). Trees reflect and absorb solar radiation before it heats the dense building and pavement materials of a home or office. Usually, trees planted to the west of a building reduce air conditioning costs the most, by blocking the afternoon summer sun when it is the hottest. There are times when trees located to the east and south of a building also provide this benefit. In tropical climates, an evergreen tree offers protection from the sun throughout the year (Harris, 1992). In colder climates, trees located south of a building should be avoided because their winter shade increases heating costs more than summer shade reduces cooling costs. The shade from trees can also reduce exposure to ultraviolet radiation, which increases the risk of some types of skin cancer.

Windbreak

Properly placed trees can reduce heating costs for a building by blocking the wind (McPherson, 1994b). Although both conifers and deciduous trees reduce wind speed, conifers tend to have a greater impact during winter months. The density, or compactness, of the trees and the planting location determine the amount of wind reduction

that occurs (Harris, 1992). In cool and windy climates, windbreak trees should be planted to the west and north of a building.

Evaporative Cooling

Urban areas typically are warmer than rural areas because of the urban “heat island” effect. Buildings, paved areas, and sparse tree canopy in an urban area contribute to the higher temperature. Trees help to reduce the air temperature around them through the evaporation of water from their leaves, acting as nature’s air conditioner.

Improvement in Air Quality

Air pollution is not only a major human health risk, but also reduces visibility and damages vegetation and man-made materials. Some species of trees do release chemical compounds (biogenic emissions) that are air pollutants. The amounts of these chemicals produced depend on the species and size of the tree. Because high temperatures increase the production of these chemicals, urban heat islands cause this type of pollution to increase. Urban trees, however, contribute less than 10 % of total pollution emissions in urban areas (Nowak, 1992), and the advantages they provide in reducing air pollution are much greater. Trees and vegetation improve air quality in several ways:

- Absorption and reduction of airborne pollutants.
- Trees, especially those with large leaf-surface areas (Nowak, 1994), absorb and trap airborne dirt and chemical particles, such as nitrogen oxide, sulfur dioxide, carbon monoxide, and ozone. Trees also help by reducing wind speed so that heavy particles settle out (Harris, 1992). Communities benefit not only from cleaner air, but also from the reduced cost of implementing air pollution controls.

Absorption of Carbon

Carbon dioxide, a by-product of burning fossil fuels such as gas and coal, is one of the primary chemical compounds that influences global warming (Akbari et al., 1992). Urban forests in the United States store millions of tons of the carbon from this compound annually, helping reduce the level of carbon dioxide in the atmosphere (Rowntree and Nowak, 1991). However, their effect on the carbon dioxide levels in cities is being studied.

Reduction of Carbon Emissions

The cooling effect of trees, including shade and evaporative cooling, decreases the demand for electricity. This results in the reduction of car-



bon emissions from power plants supplying the energy. Trees, therefore, provide the double benefit of not only storing carbon, but also helping to reduce carbon emissions.

### The Cycle

Trees and other plants make their own food from carbon dioxide (CO<sub>2</sub>) in the atmosphere, water, sunlight, and a small amount of soil elements. In the process, they release oxygen (O<sub>2</sub>) for us to breathe. Trees also:

- Help to settle out, trap and hold particle pollutants (dust, ash, pollen, and smoke) that can damage human lungs.
- Absorb CO<sub>2</sub> and other dangerous gasses and, in turn, replenish the atmosphere with oxygen.
- Produce enough oxygen on each acre for 18 people every day.
- Absorb enough CO<sub>2</sub> on each acre, over a year's time, to equal the amount you produce when you drive your car 26,000 miles. Trees remove gaseous pollutants by absorbing them through the pores in the leaf surface. Particulates are trapped and filtered by leaves, stems and twigs, and washed to the ground by rainfall.

Air pollutants injure trees by damaging their foliage and impairing the process of photosynthesis (food making). They also weaken trees making them more susceptible to other health problems such as insects and diseases.

The loss of trees in our urban areas not only intensifies the urban heat-island effect from loss of shade and evaporation, but we also lose a principal absorber of carbon dioxide and trapper of other air pollutants as well.

Some of the major air pollutants and their primary sources are:

- Carbon dioxide: burning oil, coal, and natural gas for energy; decay and burning of tropical forests.
- Sulfur dioxide: burning coal to generate electricity.
- Hydrogen fluoride and silicon tetra-fluoride: aluminum and phosphate fertilizer production; oil refineries; steel manufacturing.
- Ozone: chemical reactions of sunlight on automobile exhaust gases. Ozone is a major pollutant in smog.
- Methane: burning fossil fuels; livestock waste; landfills; rice production.
- Nitro oxides: burning fossil fuels; automobile exhausts.

- Chlorofluorocarbons: air conditioners; refrigerators; industrial foam.

The burning of fossil fuels for energy and large-scale forest fires are major contributors to the buildup of CO<sub>2</sub> in the atmosphere. Managing and protecting forests and planting new trees reduces CO<sub>2</sub> levels by storing carbon in their roots and trunk and releasing oxygen into the atmosphere (Maryland Department of Natural Resources, 2003).

Trees help cool the heat island effect in our inner cities. These islands result from storage of thermal energy in concrete, steel and asphalt. Heat islands are 3 to 10 degrees warmer than the surrounding countryside. The collective effect of a large area of transpiring trees (evaporating water) reduces the air temperature in these areas (Maryland Department of Natural Resources, 2003).

### Trees Fight the Atmospheric Greenhouse Effect:

Trees fight the atmospheric greenhouse effect. The greenhouse effect is created when heat from the sun enters the atmosphere and is prevented from radiating back into space by air-polluting gasses. The buildup of about 40 heat-trapping gasses is created mostly by human activities. Heat buildup threatens to raise global temperatures to levels unprecedented in human history. About half of the greenhouse effect is caused by CO<sub>2</sub>. Trees act as a carbon sink by removing the carbon from CO<sub>2</sub> and storing it as cellulose in the trunk while releasing the oxygen back into the air. A healthy tree stores about 13 pounds of carbon annually, or 2.6 tons per acre per year. Trees also reduce the greenhouse effect by shading our homes and office buildings. This reduces air conditioning needs up to 30 %, thereby reducing the amount of fossil fuel burned to produce electricity. This combination to CO<sub>2</sub> removal from the atmosphere, carbon storage in wood, and the cooling effect makes trees a very efficient tool in fighting the greenhouse effect (Maryland Department of Natural Resources).

### Improvement in Water Quality:

Waterways and lakes in and near urban areas can be polluted by soil erosion and water runoff that contains fertilizers and pesticides from landscaped lawns and trees, oil, and raw sewage. Trees and vegetation can help solve water quality problems in communities by reducing storm water runoff and soil erosion. Trees also absorb some of the nutrients in the soil that would be washed away. Communities can have cleaner water by managing existing natural vegetation, planting additional trees, and reducing the use of pesticides and fertilizers.

Rate and Volume of Runoff

In many communities, the rate and volume of storm water runoff has increased beyond the capacity of existing storm water drainage systems. This is caused by continued development of hard, impermeable surfaces such as roads and parking lots that cannot absorb water, thus changing natural drainage patterns. These impervious surfaces also reduce the amount of natural absorption of water by the soil and trees. Many urban forestry activities, such as creating open spaces, saving trees on construction sites, and planting trees after construction, can help reduce the amount of storm water runoff that enters the drainage system.

Raw Sewage Spillover

During heavy rainstorms, problems occur when storm water floods into the sanitary sewage system. If the sewage treatment facility cannot handle all the storm water runoff, raw sewage spills over into natural waterways. This can cause a dangerous increase of bacteria in the water. Communities with this problem may be charged large fines, suffer lawsuits from downstream users of the waterways, have to make costly improvements to the sanitary sewer system, or have to stop further development until water treatment facilities are improved. Trees, vegetation, and wetlands can help prevent this problem by interrupting and absorbing storm water runoff.

Soil Erosion

Trees can limit soil erosion by helping control storm water flow. Fibrous root systems hold soil in place so that it is not washed away by rain or flowing water (Harris, 1992). Erosion can be especially severe at construction sites in urban areas. Research has found that while forested land can lose about 50 tons of soil per square mile per year, developing areas can lose 25,000 to 50,000 tons (Lull and Sopper, 1969).

Creation of Wildlife Habitat

Urban forests serve as wildlife habitat, supplying food, water, and cover for a variety of animals, such as deer, squirrels, rabbits, reptiles, and birds. These animals enhance the recreational and educational opportunities of the community. Wildlife habitats range from streamside buffers and storm water detention ponds to backyards and parks. Corridors of trees and other vegetation connecting natural areas in the urban environment add to the wildlife habitat and increase wildlife diversity.

Increase in Community Pride

Trees are a significant part of a community, offering important benefits not easily measured.

Community Image

Imagine what a community would be like without any trees. Trees and other landscaping add beauty to an urban area. Retailers often landscape their premises to improve community image and attract customers. A visitor’s first impression of a community is greatly influenced by the trees and other landscaping.

Sense of Place

Neighborhoods with attractive landscapes foster a sense of community and belonging (Dwyer et al., 1991). People often identify with their own community by its tree-lined streets and historic groves of trees. Trees may also be associated with specific places, such as palm trees at a beach, or memories of past events or times, such as a favorite tree climbed as a youth.

Community Involvement

Community pride increases when neighborhood residents participate in local tree-planting programs. Such activities enhance a sense of ownership and an ongoing interest in developing and maintaining trees. This participation increases the success rate of the planting program. However, without local involvement in the planning and planting of the trees, the efforts may be viewed negatively by the residents (Miller, 1988).

Historical Trees

Many communities have historical trees that have become landmarks. They may also be a focus point in the community’s identity, such as the live oaks or magnolias that are part of the culture in many southern cities.

Decrease in Violence

Less violence occurs in urban public housing where there are trees. Researchers (Sullivan and Kuo, 1996) suggest that trees afford a place for neighbors to meet and get to know each other. Their research showed that friendships developed into a network of support.

Positive Impact on Consumer Behavior

Research from the University of Washington indicates that in business districts “...healthy and well-maintained trees send positive messages about the appeal of a district, the quality of products there and what customer service a shopper can expect” (Wolfe, 1998).

**Increase in Recreational Opportunities**

Many city residents appreciate the recreational benefits urban forests provide. With the growing emphasis on physical fitness, urban forests, parks, and open spaces have become increasingly popular as places to walk, run, bike, and hike. Urban parks are often sites for large community events, such as art and music festivals. Some festivals are centered around trees such as the Cherry Blossom Festival in Macon, Georgia and the Dogwood Festival in Paducah, Kentucky.

**Improvement in Health and Well-being**

Life in a bustling urban setting can be both physically and mentally stressful, but there are indications that trees and other plants help improve human health.

**Physical and Mental Health**

The soothing influence of trees can help reduce stress levels and increase enjoyment of everyday activities.

**Recuperation Rates and Therapy**

One study of recuperation rates after surgery found that patients whose windows offered a view of a wooded landscape recovered faster and with less medicine than patients who could only look out on brick walls (Ulrich, 1984). Therapists are now using trees and other plants to help people with physical and mental problems.

**Part of Nature**

Trees bring urban residents closer to nature. A healthy urban forest is the most effective way to reestablish this sense of being part of the larger natural environment. Some people have a strong emotional attachment to trees. The “People-Plant Council” at Virginia Tech University, Blacksburg, Virginia is one group that studies the ways that trees improve our health and well-being.

**Reduction of Noise Levels**

Trees and vegetation can form a barrier that partially deadens the sound from traffic, lawn mowers, and loud neighbors. To be effective, the landscaping should be dense, tall, and wide, and planted close to the source of the noise. Trees also create background noise of rustling leaves and wind through the branches that can help muffle other noises (Harris, 1992).

**Creation of Buffer Zones**

Trees serve as screens by hiding unattractive areas and objects, such as junkyards and dumpsters. With proper design, tree plantings can also

redirect attention away from unsightly areas. Planting designs can be used to direct automobile or pedestrian traffic.

**Costs of the Urban Forest**

A healthy urban forest requires an investment of money. The cost of urban trees varies widely and depends upon such site factors as location, species, and maintenance needs. Each of these factors needs to be considered when deciding to plant, maintain, or remove a tree in an urban area, whether it be an individual tree or a large-scale planting. With careful planning and coordination, these expenses can be minimized. Some of the costs involved in urban forestry are:

- Planting
- Maintenance and removal
- Infrastructure repair
- Litigation and liability
- Storms
- Program administration
- Allergies

**Planting**

The cost of planting depends on the species, size, site location, site preparation, and labor. Planting costs include purchasing the trees themselves and paying for site preparation, installation, and initial care. In 1994, McPherson found that planting and establishing a tree often represents a large percentage of total cost. Usually, the larger the tree, the higher the planting cost. Many problems and future costs can be avoided by tree selection, site preparation, and planting techniques.

**Maintenance and Removal**

Maintenance costs vary tremendously and depend on the species and site location. It is important to know what funds and personnel are available for maintenance work. By providing regular maintenance, future costs can often be prevented while increasing the tree’s value. Some of the major maintenance costs are:

**Pruning**

All trees require periodic pruning, but the frequency depends on the species, age of the tree, and location. Young trees need frequent pruning to develop a strong branching structure. The amount of pruning needed is also related to the site location. Trees located near overhead utility lines or sidewalks need more frequent attention.



Choosing a species that is compatible with the site will help reduce pruning costs.

Irrigation

In some locations, irrigation systems are needed to supplement rainwater. The cost of installing the irrigation system and supplying water are part of the maintenance cost. Irrigation can keep the tree from being stressed during droughts. However, the soil moisture needs careful monitoring to prevent overwatering, which can also cause stress. Generally, species native to the area do not need irrigating after establishment. Selecting a drought-tolerant species can help reduce irrigation costs.

Insect and Disease Control

There are times when trees need to be treated for insects and disease. Costs of insect and disease control can be reduced by selecting a species that is resistant to insects and disease, planting a variety of species, matching species to the site, and using proper planting techniques.

Tree Removal

Trees need to be removed in urban areas for many reasons. Hazardous trees, which are trees that have potential to fail and hit a target, can cause injuries or death and damage personal property. A tree may also need to be removed if it is interfering with water and sewage pipes or utility lines. However, it may be cheaper to relocate utility lines than remove the trees. Many trees need to be removed because of storm damage. Usually, the larger the tree, the more it costs to remove. Matching the growth habits of a tree to site conditions will increase its vitality and life span and avoid its untimely removal.

Tree Residue from Pruning and Removal

When trees are pruned or removed, the residue must be recycled or disposed of. Sending the residue to the landfill is a costly option for some communities. Many communities, homeowners, and utility companies now recycle tree residue into mulch, firewood, compost, and boiler fuel instead of sending it to the landfill. These alternatives may reduce costs and even generate revenue.

Infrastructure Repair

Tree growth can damage the infrastructure of a community, such as utilities, sidewalks, curbs, and sewer and water pipes. Sometimes repairs can cost less than removing and replacing the trees. Proper site and tree selection can prevent or minimize future infrastructure conflicts.

Litigation and Liability

There can be legal costs when trees are damaged or when trees cause damage. Property owners may sue when trees are harmed by construction on adjoining property, or when trees die after underground utilities lines are installed. Trees are sometimes stolen, especially unique specimens or rare species. The damage caused by falling trees or limbs, such as during storms or from hazard trees, can also result in legal action. Sidewalks damaged by tree roots can cause trip-and-fall accidents, a common source of liability claims. Careful planning can preclude many of the costs related to the damage of trees during development and construction projects. Selecting an appropriate species for the location and assuring proper maintenance can decrease the injuries and damage caused by trees.

Storms

Storms, such as hurricanes, tornadoes, ice, snow, and wind, can cause major damage to the trees and property in a community. Costs of cleaning up, repairing, and replanting after storms can be minimized by diligent maintenance.

Program Administration

Managing the urban forest requires planning and a trained workforce to carry out those plans. Communities must pay the costs of the people and materials used in these programs.

Allergies

Trees produce pollen that causes allergies for some people. Individuals have the expense of doctor visits and medication. Cities, in an effort to lessen the problems by controlling or regulating the type of trees planted, may incur additional management expenses.

General Guidelines for Planting and Selecting Trees

Site Location

The site location offers clues on potential stresses that may impact tree health and maintenance. For example, a tree located on a downtown sidewalk will probably require more maintenance than one located in a park. Sites where there is pedestrian and vehicular traffic require special attention.

Streets, Sidewalks, and Other Paved Areas

If the site is located near a street, sidewalk, bike path, or other paved area, several site factors must be considered.

- Pedestrian and vehicular areas. For any site near where pedestrians or vehicles travel, tree species selection is critical. Species with thorns or prickly foliage or soft, messy fruit should be avoided. Trees with drooping branches will require frequent pruning. For public safety, it is always important that traffic lights, signs, and intersections not be obstructed by trees.
- Conflicts with roots and pavement. Tree roots may grow under asphalt or cement pavement, which can cause the pavement to crack and buckle. Some communities have tried using root barriers and root training to avoid root-pavement conflict. There are different types of root barriers, from cylinders to herbicide strips that are placed in the planting site. They are designed to physically deflect the roots away from the pavement. In some cases they do prevent root growth near sidewalks, but they may also limit tree growth. Root training is an option that uses chemical and physical barriers, deep fertilization, and irrigation or aeration structures to improve the soil conditions in the deeper soil horizons. If the barriers are successful, the roots will grow deeper, avoiding surface problems such as cracked sidewalks.

## Types of Planting Sites

Several types of planting sites are unique to urban areas, including street lawn, tree pit, and roadway. These sites may require special considerations when selecting a species and choosing a proper planting technique.

### Street Lawn

The street lawn, also known as the tree lawn, is the space between the curb and the sidewalk. Depending upon on the mature size of the planted tree, the street lawn should be at least three feet wide. If there is a choice, a street lawn is preferred to a tree pit because the street lawn has a continuous strip of soil. Do some checking before planting in a street lawn because of the potential conflicts with pavement, utilities, and local highway department guidelines.

### Tree or Planting Pit

Tree or planting pits are small areas of soil within a sidewalk, parking lot, or other paved area. They are common in urban areas because often this is the only space available for planting trees. They also offer the advantage of softening the hardscape in urban areas. Trees planted in tree pits usually require special attention because of the unique growing conditions at the site.

## Roadway

Tree plantings in the median and on the sides of the roads provide many benefits such as intercepting dust and particulate matter; reducing glare, noise, wind, and erosion; visually separating opposite lanes of traffic; and reducing mowing costs. However, trees near roadways can be damaged by vehicles, lawnmowers, string trimmers, and herbicides.

Knowing the soil conditions near a roadway is essential to selecting a site. Drainage problems are common because the sites usually have disturbed soil that has been placed on top of compacted soil. It is also common to find construction rubble from road projects in the soil. Planning helps to avoid future problems with the trees and the pavement.

The state department of transportation usually has specific guidelines for plantings near roadways, such as species selection, planting distance from pavement, and distance between trees. It is important to work with them, especially during the planning phase.

## Selecting a Tree Species

Trees may experience different types of stress and respond to stress in different ways. Some tree species can tolerate stress, such as poor soils and adverse environmental conditions, better than other species.

## Growth Factors

Several factors related to growth should to be considered when selecting a species.

### Mature Size and Form

The mature size and form of the tree crown and root system are important because of potential interference with utility lines, pavement, structures, and signs. For example, it would be best to select a small or medium-size tree for a site located under a utility line.

### Growth Rate

The reason for planting a tree may make the growth rate important in selecting the species. A fast growth is important for trees planted for shade or screening. However, some fast-growing species have weak wood and are prone to breakage. This makes the tree susceptible to storm damage and other hazards. Growth rate may affect how well the species compartmentalizes injuries.



Branching Pattern

Alternate branching patterns are strongest and, therefore, preferable. Some species grow this way naturally, and others can be trained to do this with early pruning. The branching pattern is important when selecting at tree for a site that is subject to strong winds and storms.

Leaves

Most hardwoods are without leaves in the winter while evergreens have needles all year long. This is important when planting a tree to reduce energy costs for a building. There are positive and negative considerations about the leaves of different species, including fall color, thorns, or prickly foliage.

Flowers, Fruits, Seeds, and Bark Texture

Often a species is selected for the flowers, fruits, or seeds that it bears, or the texture of its bark. It is important to know the type of flower, fruit, and seed the tree produces, and how often this cycle occurs. The flowers, fruits, and seeds may be a source of beauty or food, or they may cause problems because of the litter, smell, or seeds they produce. This is especially true if the tree is near a sidewalk or road.

Soil Requirements

Each species of tree has different soil requirements but may adapt to a range of soil conditions. Some species can tolerate wet or compacted soils, while others are more drought tolerant. Species may also have different soil pH requirements and need different amounts of nutrients for healthy growth. If soil conditions are less than optimum for a specific species, it may be best to select either another site for the tree or another species for that site.

Selecting Tree Stock

General Appearance

- A healthy, well balanced crown
- No signs of insect or disease damage

Trunk, Branches, and Bark

- Straight, single trunk
- Trunk centered and firmly attached to rootball
- Evenly distributed branches with wide angle of branch attachment
- No severe pruning cuts, scars, swollen or sunken areas, or wounds

- No insect or disease damage, such as borer holes
- No paint on wounds or cuts
- Usually smooth bark with no cracks, splits, or sunken areas
- Bright green underneath top layer of bark

Healthy Leaves

- Green to dark green leaf color depending on the species and season
- No insect or pesticide damage, such as bare spots or discoloration

Roots

- Healthy, white roots with evenly distributed lateral growth
- No circling or matted roots (However, if the tree has circling roots, cut them in several places to prevent them from becoming girdling roots. For matted roots, making two or three vertical slices into the rootball with a sharp knife, or loosen the roots carefully by hand.)
- No girdling of roots

Source of Tree Stock

Tree stock survives best if it is planted in the same climate and soil conditions in which it was originally grown. Find out where the tree was grown when purchasing stock for planting. For example, a tree grown in a Texas nursery may not adapt well to a site in Virginia.

Conclusion

Urban and community forestry can make a difference in our lives. Each one of us can make a personal contribution. As we develop and apply technologies for a better way of life, the side effects often adversely affect our natural environment. For example, in our urban areas summer temperatures and noise levels are higher than in the surrounding countryside. Air pollution problems are more concentrated, and the landscape is significantly altered, reducing personal health benefits previously available to us by having access to wooded areas and green open spaces. Trees help solve these problems. Currently, 85 % of us live in cities and towns and we can act individually to improve our natural environment through the planting and care of trees on our own streets, and corporately through supporting community-wide forestry programs. Through technology we are learning more about trees and how they benefit mankind, and how each one of us can do a better job of planting and caring for these trees that make up our own urban forests.

The urban forest is an indicator for the health of the humans in that area. In short, our health can be judged by the health of our urban forests.

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